

IN THE CLAIMS:

Claims 1-18. (Previously canceled)

19. (Currently amended): A recombinant microorganism capable of producing 1,3-propanediol from a carbon source said recombinant microorganism comprising

- a) at least one introduced gene encoding a glycerol or diol dehydratase activity;
- b) at least one introduced gene encoding a glycerol-3-phosphatase; and
- c) at least one introduced gene encoding protein X,

wherein the gene encoding protein X is i) isolated from a glycerol dehydratase gene cluster from an organism selected from the genera consisting of *Klebsiella* and *Citrobacter* or ii) isolated from a diol dehydratase gene cluster from an organism selected from the genera consisting of *Klebsiella*, *Clostridium* and *Salmonella* and wherein protein X has no enzymatic activity, having at least 50% similarity to protein X encoded by the nucleic acid sequence of residues 9749—11572 of SEQ ID NO:19 or protein X encoded by ORF Z of the dha regulon of the genus of *Citrobacter*, wherein production of 1,3-propanediol is greater in the recombinant microorganism than in the absence of said nucleic acid gene encoding protein X.

20. (Currently amended): The recombinant microorganism of Claim 19 further comprising d) at least one introduced gene encoding a protein selected from the group consisting of protein 1, protein 2 and protein 3, wherein said protein 1 has an amino acid sequence of at least 95% similarity to SEQ ID NO:60 or SEQ ID NO:61; said protein 2 has an amino acid sequence of at least 95% similarity to SEQ ID NO:62 or SEQ ID NO:63; and said protein 3 has an amino acid sequence of at least 95% similarity to SEQ ID NO:64 or ~~having at least 50% similarity to a protein selected from the group consisting of SEQ ID NO:60, SEQ ID NO:61, SEQ ID NO:62, SEQ ID NO:63 SEQ ID NO:64 and SEQ ID NO:65~~

21. (Currently amended): The recombinant microorganism of Claim 19, wherein the microorganism is selected from the group of genera consisting of *Citrobacter*, *Enterobacter*, *Clostridium*, *Klebsiella*, *Aerobacter*, *Lactobacillus*, *Aspergillus*,

Saccharomyces, *Schizosaccharomyces*, *Zygosaccharomyces*, *Pichia*, *Kluyveromyces*, *Candida*, *Hansenula*, *Debaryomyces*, *Mucor*, *Torulopsis*, *Methylobacter*, *Escherichia*, *Salmonella*, *Bacillus*, *Streptomyces* and *Pseudomonas*.

Claims 22 - 25. (Canceled)

26. (Original): The recombinant microorganism of Claim 19 wherein said dehydratase activity is heterologous to said microorganism.

27. (Original): The recombinant microorganism of Claim 19 wherein said dehydratase activity is homologous to said microorganism.

28. (Currently amended): The recombinant microorganism of Claim 19 wherein the gene encoding protein X consists of nucleotides ~~has the sequence as shown between positions 0749 –11572 of SEQ ID NO:19 or ORF Z from Citrobacter dha regulon.~~

29. (Original): The recombinant microorganism of Claim 20 wherein protein 1 has the sequence as shown in SEQ ID NO: 60 or SEQ ID NO: 61.

30. (Previously amended): The recombinant microorganism of Claim 20 wherein protein 2 has the sequence as shown in SEQ ID NO: 62 or SEQ ID NO: 63.

31. (Previously amended): The recombinant microorganism of Claim 20 wherein protein 3 has the sequence as shown in SEQ ID: 64 or SEQ ID NO: 65.

Claims 32 – 40. (Canceled)

41. (New): The recombinant microorganism of Claim 19, wherein the carbon substrate is selected from the group of monosacchrides, oligosaccharides, polysaccharides and one-carbon substrates.

42. (New): The recombinant microorganism of Claim 21, wherein the recombinant microorganism is an *E. coli*, a *Klebsiella spp.* or a *Saccharomyces spp.*

43. (New): The recombinant microorganism of Claim 19, wherein the gene encoding the glycerol-3-phosphatase is selected from the group consisting of a nucleic acid molecule encoding the amino acid sequence of SEQ ID NO:17, SEQ ID NO:33, and enzymatically active fragments thereof.
44. (New): The recombinant microorganism of Claim 19, wherein the gene encoding the dehydratase activity is a glycerol dehydratase of *Klebsiella pneumoniae*.
45. (New): The recombinant microorganism of Claim 19, wherein the gene encoding protein X is a nucleic acid molecule encoding the amino acid sequence of SEQ ID NO: 66 or SEQ ID NO: 59.
46. (New): The recombinant microorganism of Claim 19, wherein protein X is encoded by the ORF Z of the *Citrobacter dha* regulon.
47. (New): A recombinant *E. coli* capable of producing 1,3-propanediol from a carbon source said *E. coli* comprising
- a) at least one introduced gene encoding a glycerol or diol dehydratase, and
 - b) at least one introduced gene encoding protein X,
- wherein
- (i) protein X has no enzymatic activity,
 - (ii) the gene encoding protein X is isolated from a glycerol dehydratase gene cluster from an organism selected from the genera consisting of *Klebsiella* and *Citrobacter*, or the gene encoding protein X is isolated from a diol dehydratase gene cluster from an organism selected from the genera consisting of *Klebsiella*, *Clostridium* and *Salmonella*,
 - (iii) the carbon source is selected from the group of monosaccharides, oligosaccharides, polysaccharides and one-carbon substrates, and
 - (iv) production of 1,3-propanediol is greater in the recombinant *E. coli* than in the absence of said gene encoding protein X.
48. (New): The *E. coli* of Claim 47 further comprising at least one introduced gene encoding a protein selected from the group consisting of protein 1, protein 2 and protein

3, wherein said protein 1 has an amino acid sequence of at least 95% similarity to SEQ ID NO:60 or SEQ ID NO:61, said protein 2 has an amino acid sequence of at least 95% similarity to SEQ ID NO:62 or SEQ ID NO:63; and said protein 3 has an amino acid sequence of at least 95% similarity to SEQ ID NO:64 or SEQ ID NO:65.

49. (New): A recombinant microorganism capable of producing 1,3-propanediol from a carbon source said microorganism comprising

a) at least one introduced gene encoding a glycerol or diol dehydratase activity;
and

b) at least one introduced gene encoding protein X, wherein the gene encoding protein X

(1) consists of nucleotides 0749 - 11572 of SEQ ID NO: 19;

(2) is an isolated nucleic acid molecule that hybridizes with (1) under the following hybridization conditions 0.1 x SSC, 0.1% SDS at 65°C, or

(3) is an isolated nucleic acid molecule that is completely complementary to (1) or (2),

wherein production of 1,3-propanediol is greater in the recombinant microorganism than in the absence of said gene encoding protein X.

50. (New): The microorganism of Claim 49 further comprising at least one introduced gene encoding a protein selected from the group consisting of protein 1, protein 2 and protein 3, wherein said protein 1 has an amino acid sequence of at least 95% similarity to SEQ ID NO:60 or SEQ ID NO:61, said protein 2 has an amino acid sequence of at least 95% similarity to SEQ ID NO:62 or SEQ ID NO:63; and said protein 3 has an amino acid sequence of at least 95% similarity to SEQ ID NO:64 or SEQ ID NO:65.

51. (New): The microorganism of Claim 49, wherein the recombinant microorganism is an *E. coli*, a *Klebsiella spp.* or a *Saccharomyces spp.*